N. B. After the diſcharge of the whole *fœtus*, the patient had milk in her breaſts, as upon a natural delivery.

Debenham, Jan. 18.
1750-51.

Tho. Debenham.

XIV. *New Diſcoveries relating to the Hiſtory of* Coral, *by Dr.* Vitaliano Donati. *Tranſlated from the* French, *by* Tho. Stack, *M. D. F. R. S.*

Read Feb. 7. 1750.

§ 1 CORAL is known to be a marine vegetation, which in ſhape nearly reſembles a ſhrub ſtripped of its leaves.

§ 2. It has no roots, but is ſupported on a broad foot, or baſis, which adapts itſelf, as wax well-preſs'd, and ſticks to any body in all its parts, with ſuch firmneſs, that it is utterly impoſſible to diſengage it. The ſhape of this foot is not always the ſame; but, for the moſt part, it approaches to rotundity (Tab. III. Fig. 1. *n, n*). The only uſe of this part is to hold the coral fixed, and ſupport it; not to nouriſh it: ſince there are found pieces of coral, with their feet broken off, and ſeparated from the place that ſupported them; which pieces nevertheleſs continue to live, to grow, and to propagate, at the bottom of the ſea.

§ 3. From this foot ariſes a trunk, generally ſingle, the greateſt thickneſs of which ſeldom exceeds an inch Paris meaſure, as I have been aſſured by old coral-fiſhers.

§ 4. Out of this trunk the branches ſhoot, which commonly are few in number; and they afterwards divide into ſeveral ſmaller and ſlenderer branches. For the moſt part, the branches are disjoined, and ſtand ſeparate; but yet it is ſometimes obſerved, that two or more branches ſpring from the foot united and parallel, and, as it were, clung together ſo intimately, that the place of their union cannot be diſtinguiſhed. We frequently ſee two branches adhere and unite in the ſame manner, in whatever place they happen to touch: and I have likewiſe obſerved, that, from two branches thus united, there aroſe afterwards but a ſingle branch.

§ 5. One thing ſeems to me worthy of notice; which is, that, if a ſhell happens to ſtick to the trunk or branches of the coral, it is in time ſurrounded and covered, either in part, or in the whole, with the ſame coralline matter, to which it ſtuck.

§ 6. The greateſt height, to which I have ſeen coral riſe in the Adriatic, is a Paris foot, or ſome little matter more. And even this height is very rare in that ſea.

§ 7. The trunks, as well as the branches, are commonly round; and yet we frequently find, that ſome are flatted and broad, of which I have ſome ſpecimens in my collection.

§ 8. The foot, trunk, and branches of this ſea-production are of one uniform matter; that is, they are formed of a ſubſtance homogeneous in all its parts, and of a bark or coat.

§ 9. The ſubſtance forms the inward part of the coral; and this, even at the bottom of the ſea, is of an hardneſs little inferior to that of marble. At the

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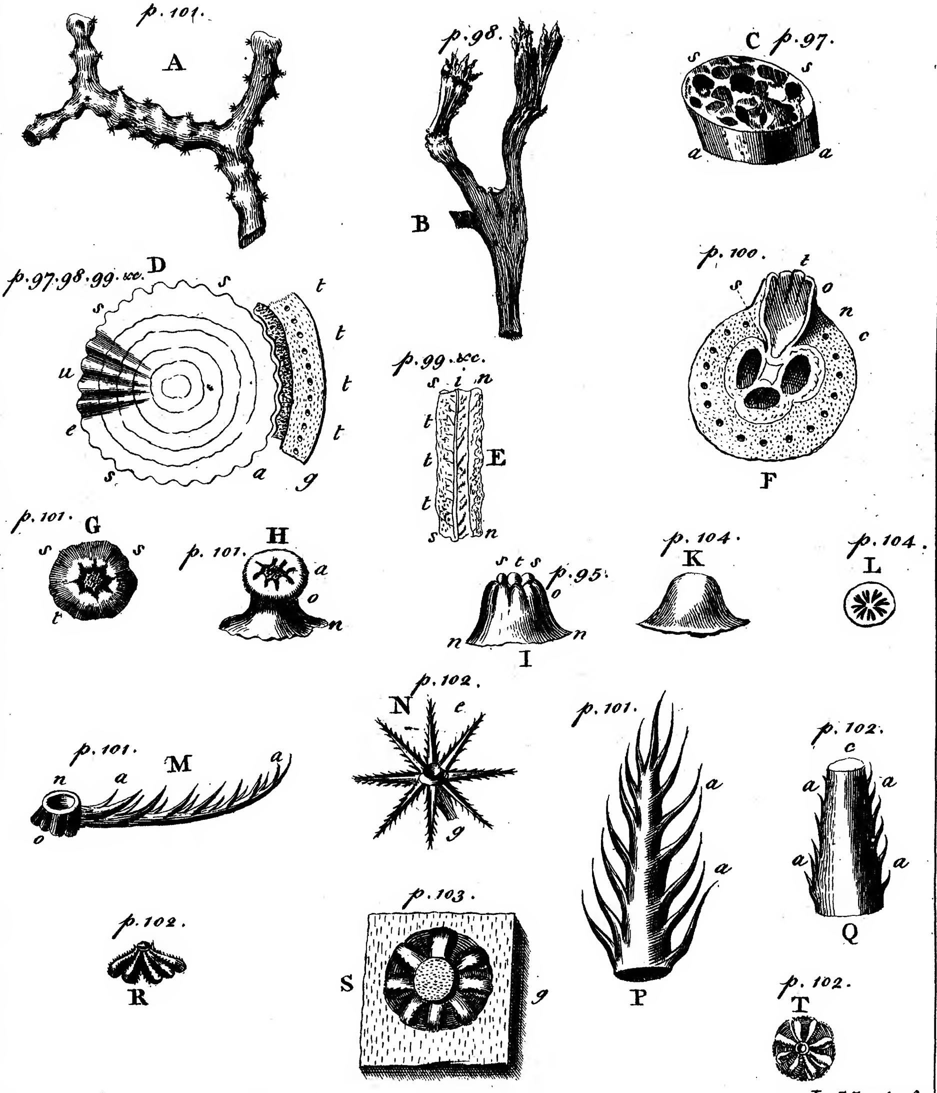

J. Mynde ſc.

ends of the branches it is not ſo hard as the bark; in ſome places near the ends it is of equal hardneſs with it; but in the thick branches and trunk it is harder.

§ 10. This ſubſtance, being obſerved by a microſcope, in corals of one colour, as the red, and thoſe which are not corroded by worms, appears uniform, ſmooth, without ſpots of other colours, without holes or pits, but quite even, hard, and capable of a perfect poliſh.

§ 11. But it is otherwiſe, in corals of more colours than one; as, ſometimes, in thoſe of a yellowiſh roſe-colour, and thoſe of a roſe-colour. For I have ſome branches of theſe, the tranſverſe ſections of which exhibit different lines, or annular bands (Fig. *D.* *s*, *s*, *s*, *s*,) whereof one part is a roſe-colour, and the other yellowiſh, others white, and others more or leſs charged with colour, which form concentric circles, *D. a*, like the coats of an onion.

§ 12. The ſame ſort of annular lines is obſervable in red coral a little burnt, but they are of a grey colour, and parted aſunder by a line of a deep-brown grey (*s*, *s*, *s*, Fig. *D.*).

§ 13. When this ſubſtance, tho' very hard, happens to be ſtripped of its bark, either by age, or ſome other accident, it is liable to a ſort of *teredo*, or worm; which is a ſmall animal, that enters into the body of the coral by very ſmall holes, (Fig. *C.* *a*, *a*,) gnaws its inſide, and makes itſelf roundiſh cells therein, (*C.* *s*, *s*,). Theſe cells have a communication with each other, (*C.* *a*, *a*,) and are ſeparated by very thin partitions, which weakens the coral extremely, and makes it brittle and improper for any ſort of work.

§ 14. There is alſo another worm, which paſſes thro' the coral tranſverſely from ſide to ſide, and in right lines, by ſtrait cylindrical holes.

It may not be improper to take notice here, that the hardeſt marbles, lying in the ſea, are liable to be corroded in the ſame manner.

§ 15. The ſurface of the ſubſtance of co al is furrowed and wrinkled (Fig. *B.* Fig. *D. e, u,*). The wrinkles begin from the foot, and aſcend, always nearly parallel, to the trunk and branches. However, theſe wrinkles are not ſo deep in the ſlender branches, and ſometimes are not viſible there: but they are always more elevated, and more conſiderable, in the thick branches and trunk: they are not ſmooth, but uneven, with knobs or bumps on them, and the ſurface, as it were, compoſed of very little hemiſpheres.

§ 16. This ſubſtance of the coral, being expoſed to a ſtrong fire, is reduced to a very fine aſh-colour'd powder. As common aſhes, when taken clean from burning charcoal, and examined by a microſcope, exhibit a ſort of ſkeleton, compoſed of the fibres and veſſels of the wood; ſo the aſhes of the ſubſtance of coral ſufficiently point out, of what ſort of parts it is compoſed. The microſcope diſcovers therein aſhes, formed of very ſmall white corpuſcles, united in cluſters; each one of which is nearly ſpherical. The aſhes of the bark of the coral are of the ſame ſhape and colour; ſo that the ſubſtance of coral agrees with its bark in the primitive and conſtituent parts (if I may be allow'd the expreſſion) which ſeem to be the ſame in both.

§ 17. In pieces of coral broken tranſverſely, I have often obſerved ſome prominent wrinkles, which, diſengaging

diſengaging themſelves from the exterior wrinkles above-mentioned, ran towards the center (Fig. *D. u,*). Hence it plainly appeared, that there is an affinity or connexion between the interior and exterior wrinkles.

§ 18. To the exterior wrinkles, and to the whole outward ſurface of the hard part of the coral (Fig. *D. a, s, e, s,*) there is cloſely attached a white or pale pellicle (Fig. *D. g, E. n, n,*) which is pretty ſoft, and compoſed of vaſcular and follicular minute membranes, which, by their interlacing, form a reticular body. The whole is accompanied with ſmall veſſels, which contain a whitiſh juice, that is diffuſed thro' all the *folliculi* or *membranulæ*; which have alſo attached to them certain very ſmall red corpuſcles, united together by means of other *membranulæ*.

§ 19. Theſe corpuſcles are nearly of a ſpherical figure, and, in ſize and ſhape exactly like thoſe of the aſhes of the coralline ſubſtance, and of the bark: ſo that we may properly ſay, that theſe little bodies conſtantly remain intire, even after the action of the fire; having undergone no other change but in their colour.

§ 20. In this pellicle (*E. n, n,*) the globular corpuſcles are not numerous, but the greateſt part of the ſaid pellicle is occupied by very white membranes, from which it takes its colour, and not from the red globular corpuſcles.

§ 21. This pellicle, lying immediately on the coral, depoſits the red corpuſcles, and adapts them to it: and thence it is, that the wrinkles are cover'd, as it were, by extremely little hemiſpheres; and theſe infallibly ſhew the formation of the coralline ſubſtance. If any one ſhould ask, whence can theſe little ſpheres derive their origin? my anſwer would be, without heſitation, from the *polypi* of the coral. And the reaſon is, that, if theſe *polypi* produce their eggs, as will be ſhewn in the ſequel, covered with ſuch corpuſcles, we may juſtly infer, that corpuſcles of the ſame nature, where-ever they are found, are formed by the ſame *polypi*.

§ 22. To this white pellicle is attached the bark of the coral (Fig. *D*. *t*, *t*, *E*, *s*, *s*,) which is ſoft, of a vermillion-colour, or of a brighter colour than the coralline ſubſtance. It is formed of very fine *membranulæ*, or net-work; to which are annexed, and reciprocally faſtened, the red globular corpuſcles, which cauſe its deeper colour. It is along this bark, that cylindrical veſſels (Fig. *D*. *t*, *t*, *t*, *t*, Fig. *E*. *i*, Fig. *F*. *n*,) are obſerved to run lengthwiſe of the coral; which appear by the microſcope to be parallel to each other, and out of which iſſue laterally other veſſels infinitely ſmall, (*E*. *t*, *t*, *t*,) which have a communication with the above-mention'd *membranulæ*. The uſe of theſe veſſels is to give nutriment to the coral, by means of a milky juice, which they contain.

§ 23. The ſurface of this bark is ſlippery and uneven, when the coral has been juſt fiſhed out of the ſea; ſomewhat raiſed in ſome places, in others more depreſſed and flatted.

§ 24. Moreover, there are obſerved in ſeveral parts of the ſaid bark little tubercles or prominences, (Fig. *A*. *s*,) which may be ſeen even without a microſcope. Theſe tubercles are pretty large at their bottom or baſis, and round (Fig. *I*, *n*, *n*,) grow ſomewhat narrower towards their upper part (*o*), and terminate in a lip of ſome thickneſs, regularly divided into eight parts (*I. s, s,*) (*G. s, s,*) more or leſs even; which form the mouth (Fig. *I. t, G. t, H. a,*) of each tubercle, or, to ſpeak more properly, of each cellule. The bark of the coral ends at the extremity of theſe parts: and thus it is, that all the inward part of each cellule of the white pellicle is formed.

§ 25. The white pellicle (*D. g, E. n, n,*) is doubled in ſome places, and forms a little bag (Fig. *F. s, c,*) which lines the inſide of each cellule (*F. t,*) that is, to the beginning of the lip, or, we may ſay, to about the middle of the cellule.

§ 26. The ſubſtance of the coral (*F. o,*) gives way to the cellule by ſmall cavities: yet theſe are not very viſible in the old thick branches, but they are pretty eaſily ſeen in the young and ſlender (*B. a, c,*). Thus the cellule does not end at the coralline ſubſtance; ſince the white pellicle (*F. s,*) is between it and the ſaid ſubſtance. The hollow of the cellule grows narrow into a ſort of cone, (*F. t,*) with an obtuſe *apex*; the belly of which is greater in diameter than the baſis.

§ 27. The bottom of ſuch a cellule faces the foot of the coral, and its mouth the branchy or moſt diſtant part from the foot. In this cellule is lodged the *polypus*, which is viſible to the naked eye, (Fig. *A. s,*) but its exact ſhape is only to be ſeen by the microſcope; and it was by this means, that I have been enabled to make a drawing of it.

§ 28. Wherefore it is from each cellule (*F. t, c,*) that a white, ſoft, and ſomewhat tranſparent *polypus* (Fig. *M.*) comes forth, or extends itſelf; which, in ſhape, reſembles a ſtar with eight equal rays, nearly conical, (Fig. *P.*) and furniſhed with other conical appendices (*P. a, a, M. a, a,*) which iſſue out of it on both ſides. The two rows of theſe have their direction nearly on the ſame plane. The rays are ſomewhat flatted, (*M. a, a,*) and a trough (*N. c, M. n, o,*) riſes out of their center, ſomewhat widen'd at its beginning, with an opening or great mouth at top (*M. n,*). In its ſides there are eight upright ridges, broad and elevated, and as many wrinkles, or furrows; and each ray is inſerted between every two wrinkles (*M. a, a,*).

§ 29. This trough is placed upon a ſmooth part, (Fig. *N. g,*) which we may call the belly of the animal; and this part, while the animal lives, and has not been hurt, is always erect in the cellule; tho' it be intirely diſengaged, and ſeparated all ſides, from the ſaid cellule; as may be plainly ſeen in ſome poſitions of the *polypus.*

§ 30. All theſe particularities are to be ſeen only when the coral is juſt drawn out of the ſea, and ſuffer'd to ſtand in ſome of the ſea-water: for, if you take the coral out of this water; or even if you do but touch it in the water, the *polypus* immediately retires into his cellule. In retiring, it contracts itſelf, the trough is cloſed up (Fig. *M, n, o,*) and each ray, (*Q. c,*) as alſo each appendix (*Q. a, a, a, a,*) ſhrinks, and enters into itſelf, juſt as ſnails pull in their horns: each ray pulls in about half its length, and with their ends they adapt themſelves to the edges of the trough (Fig. *T. R.*).

§ 31. It is in this poſture, that the *polypus* is ſeen the moment the coral is drawn out of the ſea. The *polypus,* in this contracted ſtate, ſeen without a microſcope, reſembles a drop of milk; and this is what all the good coral-fiſhers take for the real milk of the coral; the rather, becauſe, by preſſing the bark of the coral with the fingers, the *polypus* is forced out, and, in coming forth, it always retains the appearance of milk. And this makes me believe likewiſe, that the accurate Andreas Cæſalpinus, who was the firſt obſerver of milk in coral, in reality ſaw nothing but the *polypi* in the likeneſs of milk.

§ 32. Altho' the *polypi* have their belly (Fig. *N. g.*) quite diſengaged from the cellule, as we have ſaid above; yet they always keep it therein, ſhortening and widening it ſo, as to make it bigger than the mouth or opening of the cellule (*S. g,*): and this may be ſeen very diſtinctly, by ſeparating the cellule and its *polypus* from the ſubſtance of the coral, and then obſerving it on the back part. In this attitude it is, that we ſee, not only the belly very much ſhortened (Fig. *S. g,*) but alſo the poſture, in which the *polypus* keeps itſelf in its own habitation.

§ 33. At the bottom of the belly (*N g,*) of ſome *polypi*, I have obſerved ſome roundiſh *hydatides*, extremely ſmall and ſoft, tranſparent, yellowiſh, or tending to pale. The ſituation and figure of theſe *hydatides* induce me to believe, that they are the true eggs of the *polypus*.

§ 34. Altho' the ſize of theſe eggs is not much above the fortieth part of a line, yet, by the aſſiſtance of a good microſcope, I think I have diſcover'd therein ſome veſtiges of little grains, like thoſe, which are common on the bark and ſubſtance of coral. Theſe eggs are detached from the *polypus*, and, being ſoft, they adapt themſelves, and ſtick to the hard bodies, on which they fall. Afterwards they ſpread

at

at the foot, or bottom, and ſwell up a little (Fig. *K*,); and, in this caſe, we very well diſcern an inward cavity in them, the upper part of which becomes uneven by eight wrinkles (Fig. *L*,), but is not open as yet. Shut up within this cavity the *fœtus* of the *polypus* remains, contracted within itſelf, and, as it were, without form. In due time the *polypus* grows ripe, and, as it were, adult; and then, the upper part (Fig. *I. s*, *t*, *s*,) opening, it comes forth properly extended (*N. g*,), and thus furniſhes the coral with nutriment.

§ 35. While the firſt cellule is ſhut up, (*K.*) or the egg of the coral is in its ſubſtance, we do not find any one hard part in it like bone or marble; it is all ſoft: but afterwards, when the cellule opens, we begin to obſerve ſome hard *lamellæ*; and when it is grown bigger, and arrived at the height of about a line and half (Fig. *O.*), it widens at bottom, (Fig. *H. n*,) and at the top, (*H. a*,) and grows narrower in the middle, (*H. o*,) aſſuming the proper conſiſtence and hardneſs of coral. And as this grows, (*H.*) the *polypi* are multiplied, and new branches of coral are formed.

§ 36. Here then we ſee the vegetation of a plant, and the propagation of an animal. It is ſubmitted to the learned to decide at preſent, whether the coral belongs to one of theſe kingdoms rather than to the other; or whether, with greater juſtice, it deſerves an intermediate place.

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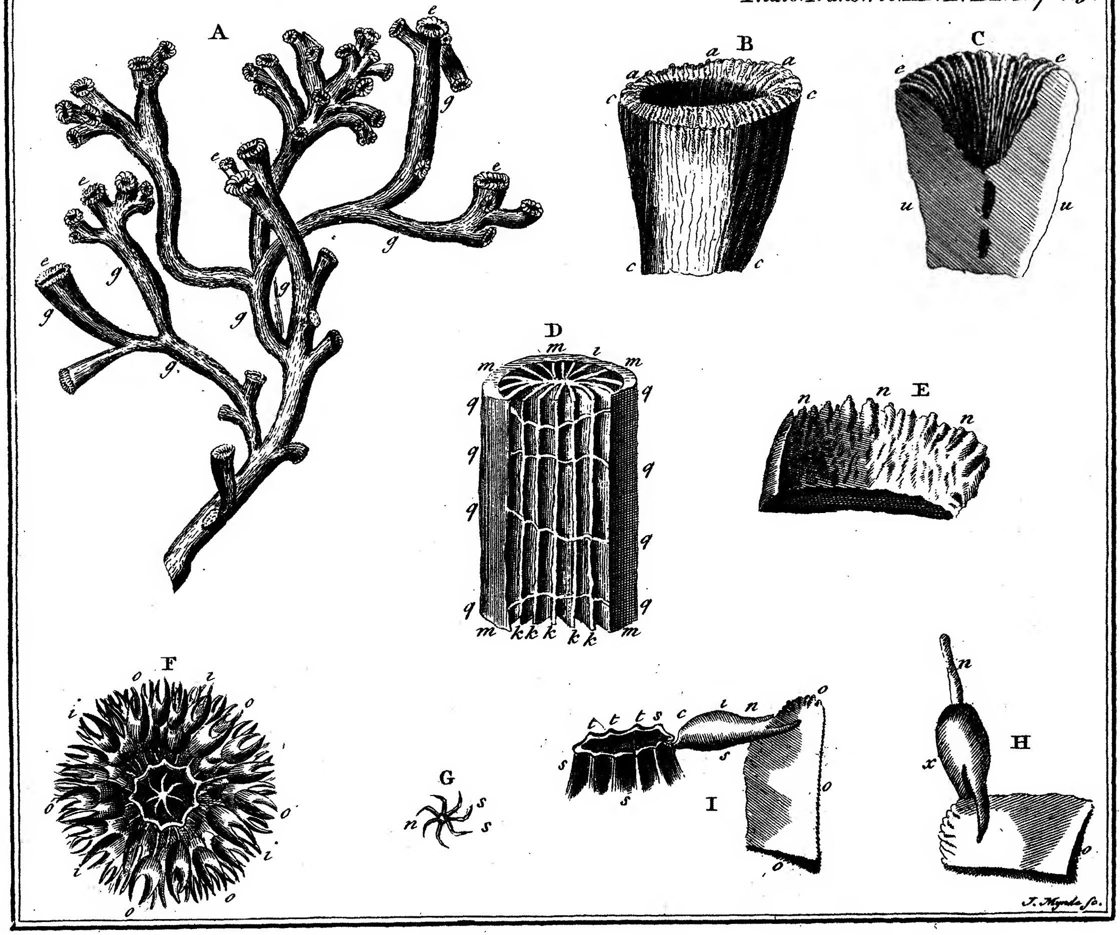

Deſcription of the Madrepora.

See Tab. III. Fig. *A.*

This is intirely like the coral, as to its hardneſs, which is equal to bone or marble. Its colour is white, when poliſhed. Its ſurface is lightly wrinkled, and the wrinkles run lengthwiſe of the branches. Its inſide is of a particular organization; having in the center a ſort of cylinder, (Fig. *D. i,*) which is often pierced thro' its whole length by two or three holes.

From this cylinder are detached about 17 *laminæ*, (Fig. *D. k, k,*) which run to the circumference in ſtrait lines (Fig. *D. m, m, m, m,*).

Theſe *laminæ* are tranſverſely interſected by other *laminæ*, (Fig. *D. q, q,*) which form many irregular cavities throughout the whole plant. The branches (Fig. *A. g, g,*) are conical; and the baſis of the cone is formed by the ſummit of the branch (Fig. *A. e, e,*). Every one of theſe ſummits has wrinkles on its outſide, which run in the longitudinal direction of the branches (Fig. *B. c, c,*); and each wrinkle anſwers to a *lamina*, (Fig. *C. e, u, e, u,*) and each *lamina* is of the ſhape of a priſm, (Fig. *E.*) the baſis of which is warty, and faces the outſide, (Fig. *C. e, u,*) and its point is cut into teeth, (Fig. *E. n, n, n,*) and belongs to the inſide. The cellule, (Fig. *B. a, a, a, c, c,* Fig. *C. e, e, u, u,*) which is of the ſhape of a chalice, is compoſed of theſe *laminæ* ranged into a circle.

In every one of theſe cellules is found a little *polypus*, repreſented in Fig. *F.* but conſiderably magnified; the mechaniſm of which is this:

Three different parts, unlike each other, compoſe this animal; *viz.* the feet, (Fig. *F. o, i,*) a trough, (Fig. *F. g, H. t,*) and an head, (Fig. *G. n.*) Each foot begins by two conical appendices (Fig. *H. o, o, o,* Fig. *I. o,*). By the union of theſe appendices a rounded part is formed, which, in ſome degree, reſembles the belly of a muſcle, (Fig. *H. i,* Fig. *I, x*) by means of which the foot is ſhortened and lengthened. To this part (Fig. *I. x,*) is annexed a little cylinder, (Fig. *I. n,* Fig. *H. c,*) the length of which is indeterminate.

Theſe feet are ranged all around in great number, and annexed to the *laminæ,* (Fig. *B. a, a, c, c,*) and are all united to the trough, (Fig. *H. c,*) on the outſide of which are ſeen ten cavities, with an equal number of prominences (Fig. *H. t, t, t, s, s, c,*) and in theſe is lodged the animal's head (Fig. *G.*) which has prickly rays, the preciſe number of which I could not determine, on account of the extreme velocity of the continual oſciliatory motion of the head from right to left, and from left to right: yet I thought I could perceive the number of theſe rays to be eight: and the uſe of them may be for the animal to catch and hold its food. This part is not always to be obſerved, becauſe it ſometimes hides itſelf, by cloſing up the trough (Fig. *H. s, s, t, c,*) about it; and, by thus covering itſelf, it is ſafe in its habitation.

As the figure of this animal bears no reſemblance to the *urtica marina,* I cannot ſee, how one could claſs the *polypus* of the *madrepora* with the *urtica.*

This animal is extremely tender, and generally tranſparent, and very beautiful for its variety of colours. I have obſerved it in ſpring and autumn in the

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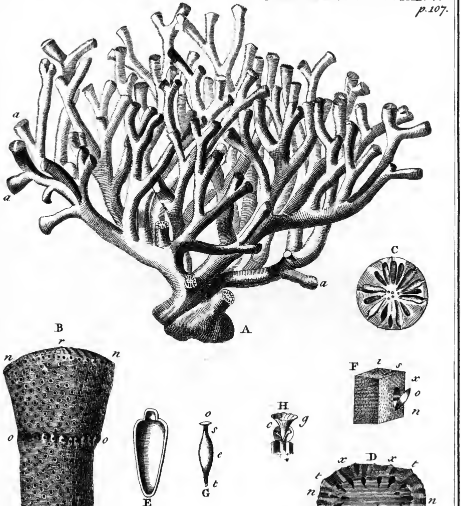

the neighbourhood of Rovigno and Orſera, where it is often fiſhed up.

A Deſcription of the Miriozoon, *or* Pſeudo-foralium album fungoſum *of* Aldrovandus.

As the ſize and ſhape of this polypary is ſufficiently ſeen in Fig. *A.* I ſhall deſcribe only what the microſcope has enabled me to obſerv'd therein; and what Count Marſigli, tho' peculiarly diligent, has either overlook'd, or examin'd with too little attention. And this I do the more willingly, as the mechaniſm of this body to me appears very wonderful.

Its ſubſtance is rather like that of bone than of marble, but brittle withal: and its brittleneſs proceeds from the great number of cellules, with which it is hollowed.

Theſe cellules are ranged all around in the branches, (Fig. *C. n, m,*) and diſpoſed in the manner of a quincunx; (Fig. *B. n, o,*) and I don't know to what better to compare the form of each cellule, than to one of thoſe cinerary urns, which are frequently found in Italy (Fig. *E. i*).

In each of theſe cellules lodges an oblong *polypus,* (Fig. *G.*) ſlender at the tail, (Fig. *G. t,*) thick at the belly, (Fig. *G. e,*) and again ſlender at the neck, (Fig. *G. e,*) to which is attached a little cover, (Fig. *G. o,* and *F. o,*) round, concavo-convex, and of a bony ſubſtance. This cover is attached by its lower part (Fig. *F. n,* and *H. e,*) to the entry of the cellule (Fig. *F. x*).

When

When the *polypus* chuſes to ſpread itſelf out, it opens the cover, and out of its neck (Fig. *H. s, s,*) thruſts an ample proboſcis, (Fig. *H. g,*) which is in the ſhape of a cup; and with this it probably takes its food. There are two little muſcles (Fig. *H. a, a,*) at the lower part of this proboſcis, which are attached to the cover.

When the animal returns into its nich, the proboſcis ſinks into itſelf; and the animal, by contracting itſelf, draws back the cover; and thus the cellule is perfectly cloſed, and the creature ſecure in its retreat.

However, all the *polypi* of this plant do not enjoy this conveniency and ſecurity, but only the adults; that is, thoſe, which dwell about the branches. As for the others, that are not as yet adult, and live and lodge on the tops of the branches, (Fig. *B. r, n, n,* and *D. n, x,*) they have no covers; and a conſiderable number of them dwell in imperfect cells, or in ſuch as are finiſhed but in part, (Fig. *D. t, t,*) and made of a ſort of cartilaginous and membranaceous materials. The imperfection of theſe cellules, and the weak conſiſtence of the paſte, which forms them, afforded me a plain proof, that the cellules are the work of the *polypi*, as the niches, wherein they lodge, are made by ſome ſhell-fiſh.